ATLAS Snowmass Spin/CP studies

- Moriond results suggest the dominant spin-parity $J^P=0^+$: ATL-CONF-2013-013, ATL-CONF-2013-029, ATL-CONF-2013-031, CMS-CMS-PAS-HIG-13-002, CMS-PAS-HIG-13-003.

- Snowmass study: sensitivity to CP-mixing, anomalous couplings in H->ZZ$^{(*)}$->4l.
  - As for the European strategy: generator level + smearing to accommodate for detector effects, event weights for trigger and lepton reconstruction efficiency.

$$A(X \to VV) \sim (a_1 M_X^2 g_{\mu\nu} + a_2 (q_1+q_2)_\mu (q_1+q_2)_\nu + a_3 \varepsilon_{\mu\nu\alpha\beta} q_1^\alpha q_2^\beta) \varepsilon_1^{*\mu} \varepsilon_2^{*\nu}$$

CP-even **CP-odd**

- Available Monte Carlo generators:
  - JHU (LO): allows to vary a_1, a_2, a_3 independently.
  - MadGraph 5 + aMC@NLO: introduces a single mixing angle between the 1st and the 3^d components of the amplitude.

- Monte Carlo re-weighting: available in JHU (ratio of $|M|^2$); can be introduced in MG5 and aMC@NLO (pre-defined set of weights corresponding to different mixing).

- Observables: it is probably most interesting to estimate the sensitivity to the mixing angle between 1st and the 3^d components and possibly to the phase. f_{a3}?

- Study methods: Matrix element likelihood fit with free parameters, Modeling mixing strength by re-weighting and comparing with $J^P=0^+$, Optimal observables analysis, Angular asymmetries.

- Given there is enough taskforce, we can add study of the VBF forward jets and fermionic channels: H->ττ/μμ.